

IMPROVEMENT OF MCMB/LiNi<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>O<sub>2</sub>  
Li-Ion BATTERY PERFORMANCE USING 3,9-  
Divinyl-2,4,8,10-Tetraoxaspiro[5,5]  
UNDERCANE

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RESULTS

The effect of additive 3,9-Divinyl-2,4,8,10-Tetraoxaspiro[5, 5] Undecane (TOS) on the MCMB/ Li<sub>1.1</sub>Ni<sub>1/3</sub>Co<sub>1/3</sub>Mn<sub>1/3</sub>O<sub>2</sub> (NCM) lithium ion battery has been studied. With addition of appropriate amount of TOS (no more than 1 wt %), the cells cycleability has been improved after 400 cycling at high temperature of 55 °C. TOS also has positive effect on the thermal aging resistance of the negative electrodes.

Without TOS, the NCM/Li cells could not survive after 30 days of high temperature aging test; however, with 1% TOS, the cells still had about 70% capacity left after more than 80 days of high temperature aging. The effect of TOS on positive electrodes was not as positive as that on negative electrodes. Slightly reduced capacity retention has been observed. Addition of TOS in the electrolyte has improved the thermal stability of the negative electrodes by delaying the SEI breakdown onset temperature and decreasing the heat accumulation to postpone the temperature rising to the positive electrode breakdown limit.

Although TOS has positive effect on the cyclability and thermal stability, the electrochemical impedance spectroscopy indicated that the addition of TOS increased the cell resistance at room temperature. With 0.5% or less TOS, the cell's impedance has only slightly increased. However, with more than 0.5% TOS added, the cell's impedance has increased dramatically.